

APPENDIX E: INTEGRATED TECHNICAL PLANNING DETAILS

E.1 Integrated Technical Planning

Planning provides the basis for effective action and the ability to anticipate and prepare for changes that inevitably affect program progress. Planning keeps all organization elements moving synchronously toward the same goal by establishing baseline expectations of future and current actions. By establishing these baselines, the organization is better equipped to adapt to the inevitable changes it faces. Planning specifies the tasks, products, responsibilities, and schedule for managing requirements throughout product development.

All System Engineering (SE) planning shall be included in the System Engineering Management Plan (SEMP) or in a separate standalone plan (e.g., risk mitigation plan), which ensures a more accurate costing of the program and significantly aids in successful program completion. The SEMP is the only implementing document that integrates all SE activities. It unambiguously ties together all elements of SE required to attain program/project cost, performance, and schedule objectives. The SEMP identifies and ensures control of the overall SE process and provides greater SE implementation detail than the Implementation Strategy and Planning (ISAP). Performing these planned activities will significantly reduce the percentage of requirements found in Operational Test and Evaluation. In the Acquisition Management System (AMS), the Exhibit 300, Attachment 3, ISAP, details the minimum planning required. The ISAP includes both programmatic and selected SE planning elements. These SE planning elements are summaries of the SEMP planning for same element. The NAS Modernization System Safety Management Plan (SSMP) governs system safety efforts conducted in the AMS and requires each program to develop, as part of the ISAP, an Integrated System Safety Program tailored to the program's safety needs. The AMS also requires the Concept and Requirements Definition plan that addresses a priority service need within the Service Level Mission Need and develops the information necessary for an Investment Analysis Readiness Decision (IARD).

E.2 SE Planning

For various programmatic reasons, SEMP elements may require a more detailed standalone plan (e.g., risk mitigation plan). A key function of any plan is to define the tasks and products of the process and to assign responsibilities to various subprocesses. Another key function is to describe the deliverables and portray the schedule for completion of each task and delivery of each product. The details for an individual standalone plan for any SE element are described below. Planning begins in Mission Analysis, with planning documents baselined at the Final Investment Analysis Decision and updated as necessary.

E.2.1 Introduction to the SEMP

As mentioned, the SEMP unambiguously ties together all SE elements required to attain program/project cost, performance, and schedule objectives. It identifies and ensures control of the overall SE process and provides greater SE implementation detail than the ISAP. SEMP development begins in Mission Analysis, with the preliminary issue of the SEMP typically occurring in the first phase of Investment Analysis, with a completed version released for Final Investment Decision (erstwhile JRC 2b). A scheduled update occurs in System Implementation, with additional updates issued as necessary to reflect changing input conditions throughout the program/project.

E.2.2 SE Plan Outputs

Each plan must describe the tasks that reflect the processes detailed in the appropriate SEM section relating to that SE element. This includes a definition of the products and responsibility for the various subprocesses of that element, as well as a task completion schedule. Also, the plan shall detail justification and deviations from the SE element process. Since a key function of the planning is to assign responsibilities to various tasks within the SE element process, one must ensure that each task (in Table E-1) is assigned to a specific individual. These assignments may vary greatly according to the product and the organization. The planning function shall provide a schedule of the SE element (e.g., Synthesis tasks). It is recommended that the schedule show the delivery dates of each product. The schedule presents the sequence of events, along with task start dates and end dates, and keys them to the events outlined in the ISAP template of Table 4.2-2 in Section 4.2, Integrated Technical Planning. Also, it is recommended that the plan reflect the principles in government and industry standards, such as MIL-STD-961 or MIL-STD-490 for specifications, and EIA 632 for the SE process.

The primary planning tool is a word-processing tool. While the primary metric of the planning process is publication of the plan on schedule, any other metrics selected will also be described in the plan.

Table E-1. Contents of the Separate SE Element Plan

SE Element (SEM Section)	What the Standalone SE Plan Contains
Requirements Management Plan (4.3)	The plan details the total effort in managing requirements, which includes identifying and capturing requirements (subsection 4.3.3.1), analyzing and decomposing requirements (subsection 4.3.3.2), and allocating requirements (subsection 4.3.3.3). The other two subprocesses in the Requirements Management Process—Develop Verification Approach and Analyze Verification Data—are the subjects of the Verification process in Section 4.12.
Functional Analysis Plan (4.4)	<p>This plan specifies the tasks, products, responsibilities, and schedule for functional analysis throughout development of the product. Because there is no program-level SEMP in the early phases of the program (i.e., phase 1 of Investment Analysis), the NAS-level SEMP guides the Functional Analysis in these phases. When the ISAP is developed, the program's tailored SEMP guides the Functional Analyses. The planning section is baselined at the Final Investment Decision and is updated as necessary at subsequent exit reviews. This planning section details the total effort for managing functional analysis. This work includes analyzing the concept of operations and environment, decomposing functions into subfunctions, decomposing and allocating requirements to functions, evaluating alternative decompositions, defining functional sequences and timelines, defining functional interfaces, and documenting the functional baseline. The outline (Table E-2) depicts the recommended contents of the Functional Analysis planning section.</p> <p>One must plan for the tasks necessary to develop each Functional Analysis product. The tasks include the following:</p> <ul style="list-style-type: none"> • Define the operational mission, environment, and requirements

	<ul style="list-style-type: none"> • Develop the Concept of Operations (Use) • Define top-level functions and decompose to the lowest level • Define internal and external interfaces • Evaluate alternative decompositions • Develop sequences and timelines • Develop functional architecture
Synthesis Plan (4.5)	<p>Synthesis planning includes all activities for transforming the needs into alternative solutions balanced to meet and provide needed capabilities while adhering to programmatic, operational, environmental, and technical constraints.</p> <p>One must plan for the tasks needed to develop each Synthesis product. These tasks include the following:</p> <ul style="list-style-type: none"> • Review the requirements baseline and functional architecture: • Design the Solution Set • Identify alternatives for the Design Solution Set <ul style="list-style-type: none"> – Perform Trade Study requests – Initiate Requirements feedback loop – Initiate design feedback loop • Allocate requirements to system elements • Define design and performance characteristics • Define physical architecture • Design alternative analysis and refinement • Check Requirements compliance • Select Preferred Design Solution
Trade Studies Plan (4.6)	<p>The plan documents the formal management planning regarding how to assess in a fair and impartial manner alternative solutions to a problem or design issue associated with a program/project product development.</p> <p>Trade Studies planning shall include the following:</p> <ul style="list-style-type: none"> • Formats for how trade study results and information are to be presented to management at design reviews • Identification of the organization or person designated to be the trade study leader • Identification of any tools that are to be used in performing the trade study (i.e., cost models, computer simulations, test articles and fixtures, and analytical tools) • Criteria (including constraints) under which the trade study is to be conducted • Instructions on where trade study results and data are to be stored for future reference, and which organization is responsible for maintaining the data • Identification of resources
Interface Management	<p>This plan documents the formal management system of interface controls that ensures physical and functional compatibility between interfacing</p>

<p>Plan (4.7)</p>	<p>hardware, software, and facilities. The plan provides the means for identifying and resolving interface incompatibilities and for determining the impact of interface design changes. It guides management, control, and documentation of all system functional and physical interfaces. The Interface Control planning section also contains interface requirements and templates for preparing, revising, and processing ICDs unique to the program. The Interface Control planning section addresses supplier participation in the interface process. The section:</p> <ul style="list-style-type: none"> • Provides the means for identifying, defining, documenting, and controlling the interfaces at all system levels • Provides the means for changing the interfaces as required by the evolution of the design and for resolving interface incompatibilities • Guides management, control, and documentation of all system functional and physical interfaces • Establishes the Interface Working Group (IWG) and its policies and procedures • Appoints the IWG chairperson, who also functions as planning coordinator and is responsible for developing and establishing the policies and process for identifying, defining, documenting, auditing, and controlling interfaces • Contains requirements and templates for preparing, revising, and processing the interface documentation; identifies products • Establishes the participants of the interface management process and their responsibilities • Establishes the interface management schedule
<p>Specialty Engineering Plans (4.8)</p>	<ul style="list-style-type: none"> • Safety (Section 4.8.1) — Refer to the NAS Modernization SSMP (http://fast.faa.gov/). The Reliability, Maintainability and Availability (RMA) plan covers all aspects of RMA (see Section 4.8.2). • The Human Factors Engineering (HFE) plan covers all aspects of HFE (see Section 4.8.3 and FAA Acquisition System Toolsets). • The Electromagnetic Environmental Effects (E3) plan covers all aspects of E3 (see Section 4.8.4). • The Quality Engineering (QE) plan covers all aspects of QE (see Section 4.8.). This includes all the systematic activities implemented within the quality system that can be demonstrated to provide confidence that a product or service will fulfill requirements. • The Information System Security (ISS) plan covers all aspects of ISS (see Section 4.8.6). • The Hazardous Materials Management/Environmental Engineering (HMM/EE) plan covers all aspects of HMM/EE (see Section 4.8.7).
<p>Analysis Management Plan (AMP) (4.9)</p>	<p>This plan defines the required levels of analysis and the data to perform an analysis; defines procedures for ensuring analyst competency; contains details on the subset of analysis methods and tools that may be used for a validated analysis; and defines the criteria to ensure integrity of the analysis results. The plan provides specific tailoring the project requires and is updated when a new tool is validated on the program or when a currently validated tool is updated to reflect a change in the product design and is subsequently revalidated. Because new methods and tools may be needed for product variants, and because multiple versions of a product may exist</p>

	concurrently, the AMP may reference multiple validated versions of the same tool.
Risk Management Plan (4.10)	The plan describes the approach, methods, procedures, and criteria for risk management and its integration into the program decision process. It is continually updated throughout the program life.
Configuration Management Plan (4.11)	<p>The plan documents the formal Configuration Management (CM) management system to ensure that the integrity and continuity of the design, engineering, and cost tradeoff decisions made among technical performance, producibility, operability, testability, and supportability are recorded, communicated, and controlled by program and functional managers. CM planning enables the following processes:</p> <ul style="list-style-type: none"> • Configuration Identification process that identifies the functional and physical characteristics of selected system components, designated as configuration items (CI), during the system's acquisition lifecycle • Configuration Control process that controls the changes to CIs during the system's acquisition lifecycle • Configuration Status Accounting process that records/reports change processing and implementation status • Configuration Audits process that supplies current descriptions of developing hardware configuration items, computer software configuration items, and the system itself
Master Verification Plan (MVP) (4.12)	The plan describes the overall verification program and provides the content and depth of detail for full visibility of all verification activities. The plan describes and defines each major verification activity. The plan provides a general schedule and sequence of events for major verification activities. It also describes test software (including code and documentation), ground support equipment, and facilities to support verification activities. The systems engineer and verification engineer develop the plan with design and test organizations, with all having a thorough understanding of the verification program concept, program requirements at all levels, and the methods identified in the Verification Requirements Traceability Matrix (VRTM) for verification.

Lifecycle Plan (4.13)	The plan ensures that resources are available for all activities required for achievement of integrated lifecycle support. Integrated Lifecycle planning includes integrated logistics support, deployment and transition, real property management, sustainment and technology evolution, and disposal.
System Engineering Process Management Plan (4.14)	The plan ensures that the resources are available for all activities required to maintain and improve the SE process.

E.2.1 Inputs to SE Element Plan

Each SE element in Table E-2 below has different required inputs. The maturity of these inputs reflects the maturity of the program.

E.2.2 SE Planning Steps

The steps for an individual plan are the same as for the SEMP (see subsection 4.2.2.2 in the Integrated Technical Planning (Section 4.2)).

E.2.3 SE Plan Inputs

The table contains the inputs for standalone plans.

Table E-2. SE Element Plan Inputs

SE Element	SE Plan Inputs
Requirements Management Plan (4.3)	<ul style="list-style-type: none"> • Internal and external requirements as defined in subsection 4.3.1 • Component-specific program guidelines • Program-specific organizational constraints and assumptions to be used in the program • Program-specific schedule constraints and events • Top-level conceptual alternatives, functional analyses, design support alternatives, and initial system evaluations • Technology availability or constraints
Functional Analysis Plan (4.4)	<ul style="list-style-type: none"> • Service Level Mission Need (SLMN) and final Program Requirements (fPR), which detail the system's expected operational environments • Component-specific program guidelines • Program-specific constraints and assumptions, such as nature of the program's project teams • Program-specific schedule constraints and events • NAS SEMP, which provides the overall plan for conducting SE as part of NAS modernization
Synthesis Plan (4.5)	<ul style="list-style-type: none"> • SLMN and fPR, which detail the system's expected operational environments • Component-specific program guidelines • Program-specific constraints and assumptions, such as nature of the program's project teams

	<ul style="list-style-type: none"> • Program-specific schedule constraints and events • NAS SEMP, which provides the overall plan for conducting SE as part of NAS modernization
Trade Studies Plan (4.6)	<ul style="list-style-type: none"> • Definition of the problem to be studied • Program/project schedule • Program/project requirements • Document preparation tools
Interface Management Plan (4.7)	<ul style="list-style-type: none"> • ISAP. This is required to enable preparation of the interface management schedule and to ensure coherent, complete, consistent, and timely interface design at all levels of the system. • The SEMP. The IM planning section depends on products defined and scheduled by the SEMP. • System Requirements Documents. The documents define the system external interfaces and the (internal) interfaces between the system segments. • System Functional and Physical Architecture. These architectures determine where the system/segment interfaces exist and are the point of departure for the detailed identification and definition of the interfaces. • Design Review Plans. These plans are used as the bases for conducting reviews and audits of the interfaces (see Synthesis (Section 4.5)).
Specialty Engineering Plans (4.8)	<ul style="list-style-type: none"> • Detailed in subsections 4.8.1 through 4.8.7.
Analysis Management Plan (AMP) (4.9)	<ul style="list-style-type: none"> • Title and brief description of the analysis • Description of programmatic benefit to be gained from successful performance of the analysis (i.e., the role the analysis plays in the program) • Relative place in the project schedule: <ul style="list-style-type: none"> – Precursor tasks and dependencies – Successor tasks that directly depend on the analysis (i.e., the interfaces of the analysis to the program) • Resources: <ul style="list-style-type: none"> – Estimate of duration and resources required; resources may include labor hours, charged computer runtime, lab support charges, and similar programmatic cost and schedule burdens – System requirements – Unique analysis technology (as used in the system being analyzed and as used to perform or support a part of the analysis)

	<ul style="list-style-type: none"> – Data sets to be used in the analysis (e.g., configuration-controlled set of data (environmental factors (atmospheric models, extent of corrosion conditions, etc.)), trade study parameters (e.g., range penalty per pound of weight added), material properties, etc.) – Analytical tool(s) selected and basis/justification of selection – Process and plan for ensuring competence of the analyst (credentials, training, certification, testing, etc.) – Subtasks to be performed to begin, perform, and validate the analysis
Risk Management Plan (4.10)	<ul style="list-style-type: none"> • Program goals • Program constraints • ISAP/Integrated Master Schedule (IMS) • Rough Order Magnitude/Basis of Estimate
Configuration Management Plan (4.11)	<ul style="list-style-type: none"> • Concepts (initial, baseline). This data identifies the functional and physical characteristics of selected system components and CIs to be controlled and managed. • Data Management plan. • Implementation strategy and Planning Requirements. This data identifies contractual and noncontractual constraints, such as program deliverables, cost, and schedule.
Master Verification Plan (MVP) (4.12)	<ul style="list-style-type: none"> • System CONOPS • SEMP • Final Program Requirements • System Physical and Functional Architectures
Lifecycle Plan (4.13)	<ul style="list-style-type: none"> • Component-specific program guidelines • Program-specific organizational constraints and assumptions to be used in the program • Program-specific schedule constraints and events • Top-level conceptual alternatives, functional analyses, design support alternatives, and initial system evaluations • Technology availability or constraints • Operational concepts
SE Process Management Plan (4.14)	<p>The process includes criteria to determine need to update SEM and SEMP, as well as schedules for SE course development and training. It also contains scheduled reviews of best practices documents for updated information.</p>

E.2.4 SE Plan Metrics

The metrics for the standalone plans are in Table E-3.

Table E-3. SE Element Plan Metrics

SE Element	Recommended Planning Metrics
Requirements Management Plan (4.3)	<ul style="list-style-type: none"> • Number of requirements, including stakeholder-specified and project-derived requirements • Number of changed requirements, including stakeholder- or project-initiated requirements • Technology requirements, including proven, to be defined, and unknown technology requirements • Unclear, undefined, or ambiguous requirements • Cycle time from requirement change initiation to decision • Cycle time from change decision to baseline incorporation • Percent of validated requirements to total proposed requirements
Functional Analysis Plan (4.4)	<ul style="list-style-type: none"> • Percent of analysis studies completed (schedule/progress) • Depth of the functional hierarchy as a percentage versus the target depth • Percent of performance requirements allocated at the lowest level of the functional hierarchy
Synthesis Plan (4.5)	<ul style="list-style-type: none"> • For approved engineering change reports: <ul style="list-style-type: none"> – Quantity, by type of problem report – Cycle time from disposition to incorporation of change into released engineering documents, by type of report • Technical Performance Measurements: objective versus achieved values • Number of approved engineering changes by product, type, and stage • Documents/drawings submitted for engineering release: <ul style="list-style-type: none"> – Unacceptable submittals – Total submittals • Number of technical action items identified during reviews and audits • Design efficiency metrics, such as weight, required power, and envelope dimensions (volume) • Cost and schedule variance for completion of Synthesis steps • System requirements not met • Number or percent of system requirements verified by system analyses • Number of TBDs (to be determined) in system architecture or design • Number of interface issues not resolved • Percent of identified system elements that have been defined
Trade Studies Plan (4.6)	<ul style="list-style-type: none"> • Cost to produce and update the plan • Trade Study Satisfaction Assessment (see Trade Studies (Section 4.6))
Interface Management Plan (4.7)	<ul style="list-style-type: none"> • Time from pPR to Interface Requirements Document (IRD) approval • Time from IRD Approval to Interface Control document (ICD) Release • ICD/Interface Requirement Compliance with Interface Requirements (% "Yes")

Specialty Engineering Plans (4.8)	<ul style="list-style-type: none"> • Completion of plan • Schedule and Progress • Resources and Cost • Process Performance • Customer Satisfaction • Product Quality
Analysis Management Plan (AMP) (4.9)	<ul style="list-style-type: none"> • Time to completion of the planning • Readiness of the plan to support management/analyst/stakeholder negotiations • Cost of the first draft, release, and maintenance of the plan.
Risk Management Plan (4.10)	<ul style="list-style-type: none"> • Total risks identified over time; total high risks, total medium risks (to provide visibility into risk trends over time) • Percent of risks (medium and high) with approved mitigation plans (to measure effectiveness of handling the risks requiring action) • Percent of overdue mitigation activities (to measure the effectiveness of meeting mitigation plan schedules) • Aging of active risk records (to gain insight into the currentness of the risk database) • Number of risks past their realization date (to provide an indicator of the effectiveness to handle risks in a timely manner)
Configuration Management Plan (4.11)	<p>Metrics criteria for CM should be associated with each CM process task. Example: CM planning:</p> <ul style="list-style-type: none"> • CM plan development milestones • Quality completeness • Adherence to the plan
Master Verification Plan (4.12)	<ul style="list-style-type: none"> • Percent of requirements validated • Percent of requirements verified • Timeliness of developing and reviewing the verification plan • Quality of developing the verification plan • Cycle time to complete development and distribution of the verification plan regarding collecting and reviewing the inputs for verification plan development
Lifecycle Engineering (4.13)	Completion of the plan
SE Process Management (4.14)	Completion of the plan

E.3 Requirement Management Planning

Table E-4 shows the table of contents for a separate Requirements Management Plan if needed. However, this planning is almost always in the SEMP.

Table E-4. Table of Contents for Requirements Management Plan

Requirements Management Plan Template		
1	SCOPE	
1.1	Overview	
1.2	Process Overview	Contains a diagram showing the interrelationships among the various process elements, including the requirements management tool, if any.
2	APPLICABLE DOCUMENTS	
3	TASKS	Describes the tasks that are tied to the specific organizational and program requirements in accordance with Section 4.3.
3.1	Identify and Capture Requirements	
3.2	Analyze and Decompose Requirements	
3.3	Allocate Requirements	
3.4	Derive Requirements	
3.5	Manage Requirements Changes	
4	PRODUCTS	Describes the various program requirements documents. It also describes what organizational entity receives the product. For example, the product team, stakeholder, other project teams, management, or outside organizations, such as manufacturing, product support, test and evaluation, or supplier management.
4.1	Requirements Documents	Enumerates and describes the various program requirements documents to be produced.
4.2	Requirements Allocation Matrices	Describes the characteristics of the requirements allocation sheets to be produced on this program.
5	RESPONSIBILITIES	Details responsibilities of the various organizational entities to accomplish the tasks of Section 3 above. The responsibilities are to be tied to the tasks of Section 3.
6	SCHEDULE	Contains schedule that is tied to the milestones of the ISAP.
7	AUTOMATED	Describes the planned use of the requirements

Requirements Management Plan Template		
	REQUIREMENTS TOOL	management tool, if available.
8	NOTES	
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E.4 Functional Analysis Planning

Table E-5 presents the table of contents used if it is determined a separate Functional Analysis Plan is needed. However, this planning is almost always in the SEMP.

Table E-5. Table of Contents for Functional Analysis Plan

Functional Analysis Plan Template		
1	SCOPE	
1.1	Overview	
1.2	Process Overview	Contains a diagram showing the interrelationship among the various process elements, including tools, if any.
2	APPLICABLE DOCUMENTS	
3	TASKS	Describes the tasks that are tied to the specific organizational and program requirements in accordance with Section 4.4.
4	PRODUCTS	Describes the various Functional Analysis outputs. Also describes what organizational entity receives the product. For example, the product team, stakeholder, other project teams, management, or outside organizations, such as manufacturing, product support, test and evaluation, or supplier management.
5	RESPONSIBILITIES	Details responsibilities of the various organizational entities to accomplish the tasks of Section 3. The responsibilities are to be tied to the tasks of Section 3.
6	SCHEDULE	Contains the schedule that is to be tied to the milestones of the ISAP.
7	AUTOMATED REQUIREMENTS TOOL	Describes the planned use of the requirements management tool, if any.
8	NOTES	
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E.5 Synthesis Planning

Table E-6 provides the table of contents used if it is determined a separate Synthesis Plan is needed. However, this planning is almost always in the SEMP.

Table E-6. Table of Contents of for Synthesis Plan

Synthesis Planning Section Template		
1	SCOPE	
1.1	Overview	
1.2	Process Overview	Contains a diagram showing the interrelationships among the various process elements, including tools, if any.
2	APPLICABLE DOCUMENTS	
3	TASKS	Describes the tasks that are tied to the specific organizational and program requirements in accordance with Section 4.5.
4	PRODUCTS	Describes the various Synthesis outputs in accordance with Section 4.5 as well as what SE element receives the product.
5	RESPONSIBILITIES	Details responsibilities of the various organizational entities to accomplish the tasks of Section 3. The responsibilities are to be tied to the tasks of Section 4.5.
6	SCHEDULE	Contains the schedule that is to be tied to the milestones of the ISAP.
7	AUTOMATED REQUIREMENTS TOOL	Describes the planned use of the requirements management tool, if any.
8	NOTES	
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E.6 Trade Studies Planning

Table E-7 features the table of contents used if it is determined a separate Trade Studies Plan is needed. However, this planning is nearly always in the SEMP.

Table E-7. Table of Contents for Trade Studies Plan

Trade Studies Plan Template		
1	SCOPE	
1.1	Overview	
1.2	Process Overview	Contains a diagram showing the interrelationships among the various process elements, including tools, if any.
2	APPLICABLE	

Trade Studies Plan Template		
	DOCUMENTS	
3	TASKS	Describes the tasks that are tied to the specific organizational and program requirements in accordance with Section 4.6.
4	PRODUCTS	Describes the output of trade studies activities.
5	RESPONSIBILITIES	Details responsibilities of the various organizational entities to accomplish the tasks of associated with trade studies.
6	SCHEDULE	Contains the schedule that is to be tied to SEMP milestones.
7	AUTOMATED REQUIREMENTS TOOL	Describes the planned use of tools.
8	NOTES	
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E.7 Interface Management Planning

Table E-8 lists the table of contents for a separate Interface Management Plan if needed. Interface Management is frequently a separate plan.

Table E-8. Interface Management Plan Outline

Interface Management Plan Outline	
1	SCOPE
1.1	Overview
1.2	System Overview
2	APPLICABLE DOCUMENTS
3	INTERFACE WORKING GROUP
3.1	IWG Policy and Procedures
3.2	IWG Membership and Responsibilities
3.2.1	IWG Chair
3.2.2	Interface Custodian
3.2.3	Interface Participant
4	INTERFACE CONTROL PROCESS
4.1	Establishing Interfaces
4.1.1	Identifying Interfaces
4.1.1.1	Scope Sheet
4.1.1.2	Documenting ICDs

Interface Management Plan Outline	
4.1.1.3	Coordinating Interfaces
4.1.1.4	Auditing, Statusing, and Controlling ICDs
4.1.1.4.1	Authorized ICD List
4.1.1.4.2	Review at SRR
4.1.1.4.3	Review at SDR
4.1.1.4.4	Review at Preliminary Design Review (PDR)
4.1.1.4.5	Review at CDR
4.1.1.4.6	Review at FCA/PCA
5	REVISING INTERFACES
5.1	Change Request Preparation
5.1.1	Review/Coordinate Change Request
5.1.2	Change Approval and Documentation
6	INTERFACE MANAGEMENT SCHEDULE
7	NOTES
Appendices	

E.8 Integrity of Analyses Planning

E.8.1 Analysis Management Planning

Compilation of the Analysis Management Plan follows the Investment Analysis Readiness Decision approval. It supports the objective of that process: "to create high likelihood that the program's analyses are credible, useful, and sufficient." Analysis Management planning defines the analyses to be performed throughout the program and the operational criteria for the analytic tools to be used, as well as the users and the requirements for verifying that the results are correct and sufficient. As a part of the SEMP, this section is reviewed with any other plans at the Final Investment Decision. The template (Table E-9) depicts the recommended contents of the Analysis Management Plan.

Table E-9. Table of Contents for Analysis Management Plan

Analysis Management Plan Template		
1	SCOPE	Covers scope and purpose. It is recommended that this section include any analysis that involves separate task management and control, or which has stakeholders from the analyst's sub-organization, or which is deemed to have a significant influence on the program product. On the other hand, minor analyses that merely fill in details of work within a single sub-organization and are small in scope are not intended to be formally controlled by this planning section (although the precepts of the process "Integrity of Analyses" always apply as a best practice).

Analysis Management Plan Template		
1.1	Overview	
1.2	Process Overview	Contains a diagram showing the interrelationships among the various process elements, including tools, if any.
2	APPLICABLE DOCUMENTS	
3	TASKS	Describes tasks described that are tied to the specific organizational and program requirements in accordance with Section 4.9.
3.1	Configuration Management	Contains specific comments on the role of Configuration Management (CM) as it applies to Analysis Management. It is recommended that approved analytic tools (including special or proprietary procedures, computer programs, networks, and workstations; and physical, computational, and hybrid models) be under CM, as well as rosters of analysts with expertise annotated. It is recommended that data sets especially be under CM, and the Analysis Management Plan requires use of configured data in managed analyses. (Several analyses using conflicting data lead to faulty conclusions that confuse a program.) Within the planning section, it is also recommended that some special notation (like {CM}) be appended to any reference of name, tool, or data that is configuration controlled.
3.2	Programmatic Approach	Contains an abstract of the programmatic approach(es) to ensure the competence of the analysts. This may range from merely listing credentials within each analysis to a rigorous testing and validation program of analysts doing certain work. With the various options chosen by the program, the reference in any one of the analysis coverage will be simplified.
3.3	Tailoring	Provides tailoring of specific documentation requirements where applicable. Coordination with the procuring authorities is recommended so that agreement is reached on what tailoring needs to be done to minimize any delay in getting the planning approved.
3.4	Organization	Discusses the organizational aspects of analysis management, which is typically a product of SE. The analyses may be performed in any sub-organization or by contractors; if so, a separate contracting plan will supplement the Analysis Management planning section. When there is more than one stakeholder for an analysis, the analysis coverage shall deal with possibly conflicting needs. Thus, a hierarchical ranking of precision, scope, timing, and quality of the analysis product will be established, and a single set of requirements levied on the

Analysis Management Plan Template		
		analysis. Analysis Management planning development, deployment, and maintenance are the responsibility of SE within the program. The data to be presented (see the "Inputs to Software/Development Planning" (subsection 4.2.4.4.3.1)) for each analysis is the responsibility of an analyst assigned to that analysis. This responsibility covers acquisition, interpretation, analysis, and transmittal of the data to the Analysis Management planning section author.
4	SPECIFIC ANALYSES	Describes each of the various analyses that qualify for inclusion in the Analysis Management planning. The format follows and addresses the items identified in subsection 4.2.4.4.3.1. The final subsection for each analysis will be the connectivity (precursor and successor tasks) of the analysis and the duration and level of effort required.
5	RESPONSIBILITIES	Describes the detailed responsibilities of the various organizational entities to accomplish the tasks of Section 4.9.
6	SCHEDULE	Contains the schedule that is to be tied to the milestones of the ISAP.
7	AUTOMATED REQUIREMENTS TOOL	Describes the planned use of the requirements management tool, if any.
8	NOTES	
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E.9 Risk Management Planning

Risk is inherent in every program. Stakeholders know this and expect contractors to address risks in program plans. SE addresses three facets of risk: technical, schedule, and cost. Technical risks include all events that may prevent the program from satisfying contractual requirements, including performance, supportability, maintainability, and regulatory requirements. Schedule risks are events that may prevent timely execution of tasks identified in the ISAP. Cost risks are events that may cause actual expenditures to exceed estimated costs.

Risk management is a key process within SE. The program and functional managers implement it by ensuring that appropriate resources are applied to reduce risk to acceptable levels. Risk management consists of five essential components: identify risks, analyze risks, identify mitigation options, implement the risk-reduction plan, and monitor risks.

The Risk Management planning section describes the approach, methods, procedures, and criteria for risk management and its integration into the program decision process. It is continually updated throughout the program life with the SEMP.

E.9.1 Risk Management Planning Outputs

Table E-10 is the template to be used for the Risk Management Plan.

Table E-10. Table of Contents for Risk Management Plan

Risk Management Planning Section Outline	
1	SCOPE
1.1	Overview
1.2	System Overview
2	RISK REVIEW TEAM
3	RISK MANAGEMENT PROCESS
3.1	Process
3.2	Risk Assessment Criteria and Mitigation Requirements
3.3	Key Decision Points
3.4	Documentation Requirements
4	RISK MONITORING PROCEDURE
5	RISK MANAGEMENT SCHEDULE
6	NOTES AND REFERENCES
7	APPENDICES
7.1	Documentation Forms
7.2	Risk Management Tools

E.10 Configuration Management Planning

The Configuration Management Organization typically owns this planning section. Inputs from the SE process may initiate the planning section as early as the Investment Analysis, phase one, but the section formally starts at Investment Analysis, phase two, and continues throughout the program lifecycle as the system develops and is modified.

E.10.1. Outputs of Configuration Management Planning

The output shall be the Configuration Management planning section of the SEMP that outlines all the tasks with corresponding completion dates and personnel responsible for task completion or a standalone plan containing the same information as the Table E-11 template.

Table E-11. Table of Contents for Configuration Management Plan

Configuration Management Plan Outline	
1	SCOPE
1.1	Overview
1.2	System Overview
2	CONFIGURATION MANAGEMENT REVIEW TEAM
3	CONFIGURATION MANAGEMENT PROCESS
3.1	Process
3.2	CONFIGURATION MANAGEMENT Assessment Criteria and Mitigation

Configuration Management Plan Outline	
	Requirements
3.3	Key Decision Points
3.4	Documentation Requirements
4	CONFIGURATION MANAGEMENT MONITORING PROCEDURE
5	CONFIGURATION MANAGEMENT SCHEDULE
6	Data Management Planning
7	NOTES AND REFERENCES
8	APPENDICES
8.1	Documentation Forms
8.2	CONFIGURATION Management Tools

E.11 Concept and Requirements Planning

The Concept and Requirements Plan (see Table E-12 template) specifies the scope, assumptions, constraints, methods, data sources, resources, control strategy, team composition, roles and responsibilities, schedule, and deliverables for a proposed concept and requirements definition (CRD) activity. The CRD addresses a priority service need within the Service Level Mission Need Statement and develops the information for an investment analysis readiness decision (IARD).

Table E-12. Table of Contents for Concept and Requirements Plan

Concept and Requirements Plan Template		
1	SCOPE	
1.1	Service Level Mission Need	Identifies the specific capabilities or components of the Service Level Mission Need Statement that will be examined.
1.2	Service Delivery Strategy	Defines how these capabilities or components fit into the overall service delivery strategy of your service organization.
1.3	Assumptions, Constraints, and Guidance	States the key assumptions, constraints, and guidance that will govern the CRD Team as it conducts CRD activities. These <u>may</u> include: <ul style="list-style-type: none"> The quantified capability shortfall that will be addressed The remaining service life of the existing capability The required operational date of any needed new or replacement capability Any component of the proposed new capability that has a higher priority for early delivery than the entire capability

Concept and Requirements Plan Template		
		<ul style="list-style-type: none"> • The required mission life or economic service life of the proposed new capability • The proposed date for the IARD—date by which all CRD activity must be complete with findings and recommendations presented to the appropriate decision board (Executive Council (EC) for Air Traffic Organization (ATO); Information Technology Executive Board (ITEB), which reviews and recommends investments related to FAA administrative and some mission support services; and the lines of business (LOB) review boards that review and recommend investments within a LOB • Any design cost, unit acquisition cost, Operations cost, or any other economic goal that must be satisfied by the new or replacement capability (e.g., “Unit initial acquisition cost must be less than \$2 Million.”) • Any ATO/LOB performance goal that must be satisfied by the new or replacement capability (e.g., “Reduce cost per flight by 1%.”) • Any milestone constraint (i.e., external influences) that must be satisfied by the new or replacement capability • Any constraints on the choice of an alternative (e.g., “No alternative may be developed that will require the mandatory carriage of new avionics by the airlines and other National Airspace System (NAS) users.”) • Any policy guidance that influences, constrains, or dictates the choice of a new or replacement capability or operational requirement • Any interdependencies with other new, existing, or proposed Federal Aviation Administration assets that must be satisfied (e.g., “Delivery of new digital Airport Surveillance Radar-11 radars must be completed prior to installation of new digital Standard Terminal Automation Replacement Systems.”) • Any NAS safety issues that influence, constrain, or dictate the choice of a new or replacement capability • Any required safety risk acceptance and safety risk management documentation.
1.	Methodology	Defines the methodologies and techniques to be used in

Concept and Requirements Plan Template		
		each CRD activity and task.
2	APPLICABLE DOCUMENTS	
3	TASKS	Define tasks necessary to ensure a program is ready for investment analysis.
3.1	Identify Required Resources	Identifies the resources and respective costs needed to complete CRD activities. For example, what team members are needed? What are the required skill levels? What level of effort must they provide (weekly time commitment)? What level of contract support is needed? Are any consultants needed? What travel, training, or technology (software or hardware) is required?
3.1.1	Personnel	Identifies required team member skill. Identify time commitment (level of effort).
3.1.2	Contract Support	Determines what level of contract support is need.
3.1.3	Training	Determines is any unique training is required.
3.1.4	Travel	Determines what, if any, travel is required.
3.1.5	Technology Needs	Determines if any technology (hardware and/or software) is needed to perform CRD process.
3.16	Costs	Determines costs for 3.1.1 through 3.1.5.
3.2	Specify Team Composition	Specifies the CRD Team composition alphabetically by name and affiliated FAA organization. Acquisition Management System policy designates ATO Operations Planning (ATO-P) Systems Engineering as lead.
3.3	Define Data Requirements	Defines the data sources that will be used for each CRD activity.
3.4	Control Strategy	Describes the control strategy that will be used by the CRD Team Lead to ensure timely delivery of quality CRD products to the EC/LOB/ITEB. Discuss how commitment to these activities will be obtained.
3.4.1	Commitment	Establishes a methodology to ensure that personnel are available to meet team commitments. This may be accomplished through a request for participation, memorandum for action or memorandum of understanding, letter of agreement, bargaining negotiations, or management coordination.
4	Deliverables	Lists and describes all CRD deliverables and provides the required completion date for each. At a minimum, CRD deliverables shall include a Preliminary Program Requirements attachment to the OMB Exhibit 300 Program Baseline, including Preliminary Program Requirements, a

Concept and Requirements Plan Template		
		Concept of Use, Functional Architecture, and Technical Description; identification of the alternatives that will be evaluated during initial investment analysis, along with a rough estimate of lifecycle cost for each alternative; an assessment of the alternatives against the Enterprise and Security Architectures; an Operational Safety Assessment; Safety Risk Management Decision Memo; and Initial Investment Analysis Plan.
4.1	System Engineering	Enumerates and describes the various system engineering analyses and documents to be produced.
4.2	Cost	Enumerates and describes the various cost analyses and documents to be produced.
4.3	Briefings	Discusses the briefings as well as the associated content, format, and scheduling criteria.
5	RESPONSIBILITIES	Defines the roles and responsibilities of each team member for each CRD activity and deliverable; also defines who will prepare CRD briefing and who will be responsible for briefing the EC.
	Develop WBS	Develops a work breakdown structure and matched organizational breakdown structure for all CRD activities and deliverables.
6	SCHEDULE	Provides schedules and an integrated network for conducting all CRD activities and completing required deliverables. The schedule should show start, duration, and completion of all major CRD activities. The integrated schedule should, at a minimum, identify such things as activity dependencies and interdependencies, slack times, and the critical path for project completion.
7	AUTOMATED REQUIREMENTS TOOL	Describes the planned use of the requirements management tool, if any.
8	NOTES	
	APPENDICES	

E.12 Verification Planning

E.12.1 Master Verification Plan (MVP)

The MVP describes the overall verification program. It provides the content and depth of detail for full visibility of all verification activities and fully describes each major verification activity. The plan provides a general schedule and sequence of events for major verification activities. It also describes test software (including code and documentation), Ground Support Equipment, and facilities to support verification activities. The systems engineer and verification engineer develop the plan with design and test organizations, with all having a thorough understanding of

the verification program concept, program requirements at all levels, and the methods in the Verification Requirements Traceability Matrix (VRTM) for verification.

E.12.2 Verification Requirements Traceability Matrix

The VRTM is that portion of a requirements document that defines how each requirement is to be verified. It includes the plan that describes the verification activity as well as the results, including traceability to testing (in the verification report). The VRTM is based on the Validation Table documented in the Validation Report. The design, test, SE, and verification team members jointly develop the VRTM. The VRTM establishes the basis for the verification program.

E.12.3 Requirements Verification Compliance Document (RVCD)

The RVCD provides the evidence of compliance for each requirement at all levels and to each VRTM requirement. The flow down from the requirements documents to the VRTM completes the full requirements traceability. Compliance with all requirements ensures that the system-level requirements have been met.

The RVCD defines for each requirement the methods of verification and corresponding compliance information. The results of the verification activity, including evidence of completion, are recorded and documented in the RVCD. It is recommended that the RVCD contain information regarding the results of each verification activity and a description and disposition of conformance, nonconformance, conclusions, and recommendations. The compliance information provides either the actual data or a reference to the location of the actual data that shows compliance with the requirement. The document also includes a section that details any noncompliances; it is recommended that this section also specify appropriate reverification procedures. The RVCD is an input into the Requirements Management process (Section 4.3). Decisions regarding what to do with noncompliant requirements are made in Requirements Management.

E.12.4 Master Verification Plan Metrics

The MVP provides the content and depth of detail for understanding the Verification activities, detailing each major activity. It contains the schedule and sequence of events. Table E.13 is a template for the plan.

Table E-13. Table of Contents for Master Verification Plan

Master Verification Plan Template		
1	SCOPE	
1.1	Overview	
1.2	Process Overview	Contains a diagram showing the interrelationships among the various process elements, including tools, if any.
2	APPLICABLE DOCUMENTS	
3	TASKS	Describes tasks that are tied to the specific organizational and program requirements in accordance with Section 4.12. Includes qualification, acceptance, predevelopment,

Master Verification Plan Template		
		operational, and disposal Verification activities for hardware, software, and procedures.
4	PRODUCTS	Describes all associated products (e.g., VRTM and RVCD).
5	RESPONSIBILITIES	Details responsibilities of the various organizational entities to accomplish the Validation and Verification tasks.
6	SCHEDULE	Contains the schedule that is to be tied to the milestones of the SEMP.
7	Validation and Test	Describes the planned test hardware and software, support equipment, and facilities required to support Verification activities.
8	NOTES	
	APPENDICES	

E.13 Lifecycle Plan (LCP)

The LCP ensures that resources are available for all activities required to integrate lifecycle support. Lifecycle planning includes integrated logistics support, deployment and transition, real property management, sustainment and technology evolution, and disposal. The planning steps for all elements are the same and are listed below. The only differences are the inputs, which appear in Section 4.13, Lifecycle Engineering.

E.13.1 Outputs of Lifecycle Planning

The output of this process is the LCP. Table E.14 is the LCP template.

Table E.14. Lifecycle Plan Template

Lifecycle Outline	
SECTION 1	INTRODUCTION
1.1	Scope
1.2	Purpose of the Lifecycle Plan
1.3	Organization of the Lifecycle Plan
1.4	ICP Overview
1.5	Program/Project Name and System Description
1.6	Program Organization
1.7	Lifecycle Responsibility Assignments
1.8	Lifecycle Environment and Tools
1.9	Lifecycle Metrics
SECTION 2	Lifecycle Engineering
2.1	ILS

Lifecycle Outline	
2.1.1	Real Property Management
2.1.2	Deployment and Transition
2.1.3	Integrated Logistics Support
2.1.3.1	Maintenance Planning
2.1.3.2	Maintenance Support Facility
2.1.3.3	Direct-Work Maintenance Staffing
2.1.3.4	Supply Support
2.1.3.5	Support Equipment
2.1.3.6	Training, Training Support, and Personnel Skills
2.1.3.7	Technical Data
2.1.3.8	Packaging, Handling, Storage, and Transportation (PHS&T)
2.1.3.9	Computer Resources Support
2.1.4	Sustainment/Technology Evolution
2.1.5	Disposal
SECTION 3	
3.1	Integrated Master Schedule for Lifecycle
3.2	Tailored ISR

E.14 Maintain System Engineering

All resources required to maintain SE are in the SEMP.

E.15 Integrated Human Factors Planning

Table E-15 shows the table of contents for a separate integrated human factors plan, if considered necessary by the program.

Table E. 15. Integrated Human Factors Plan Content and Format^[g1]

Headings		Content
Background	Program Summary	<ul style="list-style-type: none"> Briefly describe the program Describe concept of operation and maintenance
	Program Schedule	<ul style="list-style-type: none"> Provide overview of system acquisition schedule

Headings		Content
	Target Population	<p>Identify:</p> <ul style="list-style-type: none"> • Operator and maintainer • Demographics • Biographical data • Previous training • Aptitudes • Task-related experience • Anthropometric data • Physical qualifications • Organizational relationships • Workspace requirements
	Guidance	<ul style="list-style-type: none"> • Summarize any guidance received
	Constraints	<ul style="list-style-type: none"> • State if additional staffing is required by the new system • State whether an existing job series is to be used or a new one created • Post limits on the amount of time that may be afforded for training • Establish standards on the working conditions that are to be acceptable when the new system is fielded • Describe limitations imposed by maintenance policy • Develop requirements as a result of union agreements
Issues and Enhancements	Issue Description	<ul style="list-style-type: none"> • Describe the issue or problem background, importance, and consequences or task to be done to support the acquisition

Headings		Content
	Objectives	<ul style="list-style-type: none"> • Identify Human Factors Program objectives • Provide performance measures and criteria in terms of time and accuracy to perform tasks to evaluate resolution of issue • When human performance thresholds are known, identify tasks for the developer to be done early enough in the acquisition to influence requirements and system engineering • Identify the actions to be taken to resolve each issue • Show the current status of each issue
	Actions	<ul style="list-style-type: none"> • Identify actions to be taken to resolve issues • Show current status of each action
Activities	Activity Description	<ul style="list-style-type: none"> • Identify any tasks, studies, or analyses that shall be performed to resolve the issues (e.g., contractor's Human Engineering Program Plan per MIL-HDBK-46855, Functional Analysis to support equipment versus people allocation of functions, Task Analysis to produce a specific operator, and maintainer task list)
	Activity Schedule	<ul style="list-style-type: none"> • By acquisition phase, describe the human factors tasks in terms of who, what, when, and how (resources) • Identify feeds to and dependencies on ILS, training, and test and evaluation programs
Strategy	Goals and Requirements	<ul style="list-style-type: none"> • Derive Strategy from the major concerns, issues, schedule, tasks, guidance, constraints, objectives, and approach for the Human Factors Program • Answer the question, "What objectives does the government wish to achieve?" • Answer the question, "How is the government to accomplish these objectives?"

Headings		Content
	Approach	<ul style="list-style-type: none"> • Identify who is to be responsible for the Human Factors Program • Set out the extent of contractor support required • Define how human factors resources are to be organized and managed to support the system acquisition
	References	<ul style="list-style-type: none"> • Identify relevant references needed for a full understanding of the Human Factors Program
Review	Review	<ul style="list-style-type: none"> • Identify administrative handling procedures • Identify update schedule and procedure • Identify review procedures